Volume 33 Issue 3: 2024 Fall 2024

ultrasonic industry association
UIA
powering sound ideas

Vibrations

Powering Sound Ideas

UIA53 28 - 30 April 2025 in Halifax, Nova Scotia

The UIA is looking forward to an engaging event chaired by Andrew Mathieson, UIA53 Symposium Chair.

UIA53 features a balanced program of medical and industrial presentations from experts in ultrasound from throughout Canada, EU, UK, and the US. UIA offers the crossroads of manufacturing, research and academia that provides for in-depth discussion about the current and future applications of ultrasound.

A key theme of UIA53 will be Concept to IP during which transitioning intellectual property from an idea to a commercial product will be explored.

See more information about this below.

Halifax offers an exciting intersection of the implementation of ultrasonics in both academic and commercial settings.

Check page 3 for information about hotel reservations and registration fees.

Inside this issue:

We are still accepting abstracts for UIA53 - click here!

Concept to IP Featured Speakers

Melanie Nadeau Chief Executive Officer of COVE.

Jeff Leadbetter, co-founder and CEO at Daxsonics Ultrasound Inc.

Sailu Nemana Sensor Technology Ltd: Director, Ceramics Business Unit

Professor Jeremy Brown, School of Biomedical Engineering at Dalhousie University, Halifax, and co-founder of Daxsonics and Sound Blade Medical

See page 2 for more information about our featured speakers

UIA53: Featured Speakers: Concept to IP

Melanie Nadeau is the Chief Executive Officer of COVE where she is responsible for leading the strategic direction and managing overall operations to drive high-tech innovation and entrepreneurship. Previously, Melanie held executive roles for an energy and services company focused on growth strategies, overseeing annual budgets of $500M+, negotiating commercial agreements, and managing operations. She has been a noted expert for the International Energy Agency, the United Nations Environment Programme, the Intergovernmental Panel on Climate Change, and the International Electrotechnical Commission.

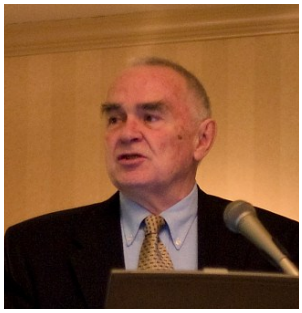
Jeff Leadbetter, co-founder and CEO at Daxsonics Ultrasound Inc, leads a team of scientists and engineers in their purpose to help the world's leading innovators in ultrasound realize their vision for new products and technologies. In Jeff and Daxsonics have supported over 60 ultrasound development projects, ranging from foundational academic research to commercial product launch, along the way gaining unique and varied insider perspective on invention, intellectual property, and commercialization.

Professor Jeremy Brown, School of Biomedical Engineering at Dalhousie University, Halifax, and co-founder of Daxsonics and Sound Blade Medical will deliver the plenary talk during the Concept to IP session.

Sailu Nemana, Director, Ceramics Business Unit, Sensor Technology Ltd

Sailu Nemana's expertise is centered on the development, commercialization and production scale up of piezoelectric ceramic materials for assembly into sensors and transducers for various applications. At his various positions at Sensor Technology Ltd, he has overseen the development chain from basic formulation research and material characterization to manufacturing implementation at commercial scale to supporting integration into assembled sensors and transducers for a variety of industries. He holds a PhD in Chemical Engineering from the University of California, Davis and has been with Sensor Technology for 15 years.

UIA53: Other Featured Speakers



Karl Graff will be joining UIA53 in person, giving a talk about his long and illustrious career in power ultrasonics, much of it at EWI and Ohio State University, and his many important contributions. Karl also served as the Executive Director for the Ultrasonic Industry Association.

Dr.-Ing. Frank Balle, Walter and Ingeborg Herrmann Chair for Engineering of Functional Materials, Albert-Ludwigs-Universität Freiburg (Germany) Faculty of Engineering, Department for Sustainable Systems Engineering (INATECH)

Frank Balle researches and develops sustainable, multi-functional materials concepts as well as their characterization and process technologies**.** He will speak on **Development of ultrasonic-assisted technologies for Circularity Engineering and value-retention**

UIA53 Registration is OPEN!

LIVE REGISTRATION FEES:

Members
Before 1 February $650

Nonmembers
Before 1 February $850

Students $495

Poster Presenters
$199 (includes Tuesday and your choice of either Monday or Wednesday at no additional charge

Daily registration - Members
$425

Daily registration - Nonmembers
$599

VIRTUAL REGISTRATION FEES:

Members $650
Nonmembers $850
Daily - members $299
Daily - nonmembers $499
Students Full - $495
Students Daily - $199

UIA53 is Multi-Access

Based on the success with offering UIA51 and UA52 to virtual participants as well as those able to join in person, UIA is committed to a multi-access program.

The program will be scheduled according to the time in Halifax. However, all sessions will be available via live-streaming and then for on-demand viewing for all UIA53 participants.

Virtual participants will have access to all the presentations, including keynote speakers, industrial and medical session presentations, and the focused speakers on Tuesday morning. The question/answer sessions will be open to the virtual participants to ask their questions.

Poster presenters will be able to give a brief overview of their posters as well as having their poster and supporting data available online for symposium participants.

Register NOW!

UIA53: Halifax, Nova Scotia Hotel Reservations

The Westin Nova Scotian is the headquarter hotel for UIA53. UIA room rates are just $269 single/ double plus 18% taxes.

Make your room reservation by calling 1-866-761-3513.
Please identify yourself as attending the UIA Annual Symposium to get this special rate.
We have rooms reserved starting on Saturday, 26 April through Thursday, 1 May.

To help you plan your stay in Halifax, you will find this link: https://discoverhalifaxns.com/ very helpful.

Ultrasound in the News

RESEARCHERS DEVELOP CLINICALLY VALIDATED, WEARABLE ULTRASOUND PATCH FOR CONTINUOUS BLOOD PRESSURE MONITORING

A team of researchers at the University of California San Diego has developed a new and improved wearable ultrasound patch for continuous and noninvasive blood pressure monitoring. Their work marks a major milestone, as the device is the first wearable ultrasound blood pressure sensor to undergo rigorous and comprehensive clinical validation on over 100 patients.

The technology, published on Nov. 20 in *Nature Biomedical Engineering*, has the potential to improve the quality of cardiovascular health monitoring in the clinic and at home.

"Traditional blood pressure measurements with a cuff, which are limited to providing one-time blood pressure values, can miss critical patterns. Our wearable patch offers a continuous stream of blood pressure waveform data, allowing it to reveal detailed trends in blood pressure fluctuations," said study co-first author Sai Zhou, who recently graduated with his Ph.D. in materials science and engineering from the UC San Diego Jacobs School of Engineering.

The patch is a soft and stretchy device, about the size of a postage stamp, that adheres to the skin. When worn on the forearm, it offers precise, real-time readings of blood pressure deep within the body. The patch is made of a silicone elastomer that houses an array of small piezoelectric transducers sandwiched between stretchable copper electrodes. The transducers transmit and receive ultrasound waves that track changes in the diameter of blood vessels, which are then converted into blood pressure values.

Technological improvements to wearable ultrasound

The wearable ultrasound patch builds upon an earlier prototype that was pioneered by the lab of Sheng Xu, a professor in the Aiiso Yufeng Li Family Department of Chemical and Nano Engineering at UC San Diego. Researchers re-engineered the patch with two key improvements to enhance its performance for continuous blood pressure monitoring. First, they packed the piezoelectric transducers closer together, enabling them to provide wider coverage so they could better target smaller arteries such as the brachial and radial arteries, which are more clinically relevant. Second, they added a backing layer to dampen redundant vibrations from the transducers, resulting in improved signal clarity and tracking accuracy of arterial walls.

Researchers re-engineered the patch with two key improvements to enhance its performance for continuous blood pressure

In tests, the device produced comparable results to a blood pressure cuff and another clinical device called an arterial line, which is a sensor inserted into an artery to continuously monitor blood pressure. While the arterial line is the gold standard for blood pressure measurement in intensive care units and operating rooms, it is highly invasive, limits patient mobility, and can cause pain or discomfort. The patch provides a simpler and more reliable alternative, as shown in validation tests conducted on patients undergoing arterial line procedures in cardiac catheterization laboratories and intensive care units.

Comprehensive clinical validation

Researchers conducted extensive tests to validate the patch's safety and accuracy. A total of 117 subjects participated in studies that evaluated blood pressure across a wide range of activities and settings. In one set of tests, seven participants wore the patch during daily activities such as cycling, raising an arm or leg, performing mental arithmetic, meditating, eating meals and consuming energy drinks. In a larger cohort of 85 subjects, the patch was tested during changes in posture, such as transitioning from sitting to standing. Results from the patch closely matched those from blood pressure cuffs in all tests.

The patch's ability to continu-

Ultrasound in the News, continued

ously monitor blood pressure was evaluated in 21 patients in a cardiac catheterization laboratory and four patients who were admitted to the intensive care unit after surgery. Measurements from the patch agreed closely with results from the arterial line, showcasing its potential as a non-invasive alternative.

"A big advance of this work is how thoroughly we validated this technology, thanks to the work of our medical collaborators," said Xu. "Blood pressure can be all over the place depending on factors like white coat syndrome, masked hypertension, daily activities or use of medication, which makes it tricky to get an accurate diagnosis or manage treatment. That's why it was so important for us to test this device in a wide variety of real-world and clinical settings. Many studies on wearable devices skip these steps during development, but we made sure to cover it all."

NEXT STEPS

The research team is preparing for large-scale clinical trials and plans to integrate machine learning to further improve the device's capabilities.

Efforts are also underway to validate a wireless, battery-powered version for long-term use and seamless integration with existing hospital systems.

Source: https://www.sciencedaily.com/releases/2024/11/241120122153.htm

WEARABLE ULTRASOUND TECH FOR MUSCLE MONITORING OPENS NEW POSSIBILITIES IN HEALTHCARE AND HUMAN-MACHINE INTERFACES

Engineers at the University of California San Diego have developed a wearable ultrasound device that can provide long-term, wireless monitoring of muscle activity with potential applications in healthcare and human-machine interfaces. Designed to stick to the skin with a layer of adhesive and powered by a battery, the device enables high-resolution tracking of muscle function without invasive procedures.

A team of researchers led by Sheng Xu, a professor and Jacobs Faculty Scholar in the Aiiso Yufeng Li Family Department of Chemical and Nano Engineering at UC San Diego, published their work Oct. 31 in Nature Electronics. The work was a collaborative project with Jinghong Li, a pulmonologist, intensive care specialist and professor of medicine at UC San Diego Health.

In tests, the device was worn over the rib cage to monitor diaphragm motion and thickness, which are useful for assessing respiratory health. "By tracking diaphragm activity, the technology could potentially support patients with respiratory conditions and those reliant on mechanical ventilation," said Joseph Wang, a distinguished professor in the Aiiso Yufeng Li Family Department of Chemical and Nano Engineering who is a co-author on the study.

Additionally, researchers successfully used the device on the forearm to capture hand and wrist muscle activity, which enabled its use as a human-machine interface to control a robotic arm and play a virtual game.

This wearable ultrasound technology may offer a promising new alternative to the current clinical standard, electromyography (EMG), which involves applying metal electrodes on the skin to record electrical muscle activity. Despite EMG's longstanding use, it suffers from low resolution and weak signals. For example, signals from multiple muscle fibers often blend together, making it challenging to isolate the contributions of specific muscle fibers.

Ultrasound, however, provides high-resolution imaging by penetrating deep tissues, offering detailed insights into muscle function. The ultrasound technology that Xu's team and their collaborators developed has the additional advantages of being compact, wireless, and low-power. "This technology could potentially be worn by individuals during their daily routines for continuous, long-term monitoring," said study co-first author Xiangjun Chen, a Ph.D candidate in the Materials Science and Engineering program at UC San Diego.

Ultrasound in the News, continued

A key innovation of this work is the use of a single ultrasound transducer to sense deep tissues effectively.

The device is housed in a flexible silicone elastomer casing and consists of three main components: a single transducer for sending and receiving ultrasound waves; a custom-designed wireless circuit that controls the transducer, records data and wirelessly transmits the data to a computer; and a lithium-polymer battery that can power the system for at least three hours.

A key innovation of this work is the use of a single ultrasound transducer to sense deep tissues effectively. The transducer emits intensity-controlled ultrasound waves and captures radiofrequency signals that carry rich information, enabling clinical applications such as measuring diaphragm thickness. Using these signals, the device can achieve high spatial resolution, which is key for isolating specific muscle movements. To extract additional insights from these signals, the researchers developed an artificial intelligence algorithm that maps the signals to their corresponding muscle distributions, enabling it to identify specific hand gestures from the collected signals with high accuracy and reliability.

When worn on the rib cage, the device can accurately monitor diaphragm thickness with submillimeter precision. Diaphragm thickness is a metric used in the clinic to evaluate diaphragm dysfunction and predict outcomes in ventilated patients. By analyzing muscle motion, the researchers could also detect different breathing patterns, such as shallow and deep breaths. This functionality could help diagnose conditions linked to breathing irregularities, such as asthma, pneumonia and chronic obstructive pulmonary disease (COPD). In a small group trial, the device successfully distinguished breathing patterns of individuals with COPD from those of healthy participants.

Thanks to the artificial intelligence algorithm that the team developed, the system is capable of recognizing various hand gestures

"This demonstrates the technology's potential for clinical applications in respiratory care," said study co-first author Muyang Lin, a postdoctoral researcher in the Aiiso Yufeng Li Family Department of Chemical and Nano Engineering at UC San Diego.

When worn on the forearm, the device offers precise tracking of muscle motion in the hands and wrists. Thanks to the artificial intelligence algorithm that the team developed, the system is capable of recognizing various hand gestures solely from the ultrasound signals. The system is able to recognize 13 degrees of freedom, covering 10 finger joints and three rotation angles of the wrist. As a result, it can capture even slight wrist and finger movements with high sensitivity.

In proof-of-concept tests, participants used the device on their forearms to control a robotic arm to pipette water into beakers. In another demonstration, they used the device to play a virtual game, using wrist movements to control a virtual bird's flight through obstacles. "These demonstrations underscore the technology's potential for prosthetics, gaming and other human-machine interface applications," said study co-first author Wentong Yue, a Ph.D. candidate in the Aiiso Yufeng Li Family Department of Chemical and Nano Engineering at UC San Diego.

Moving forward, the researchers plan to improve the technology's accuracy, portability, energy efficiency and computational capabilities.

Source: https://www.sciencedaily.com/releases/2024/10/241031124459.htm

Continued on the next page

Ultrasound in the News, continued

NOVOSOUND ANNOUNCES NEW ULTRASONIC BLOOD PRESSURE MONITOR

Scottish tech company Novosound has developed an ultrasonic blood pressure monitor, claimed to be the first in the world, designed to miniaturise and enhance the accuracy of blood pressure monitoring in wearable devices.

This innovation promises to bring medical-grade monitoring to everyday wearables such as smartwatches and rings.

Built on the company's Slanj platform, this technology is not just a laboratory concept but has been tested in real-world environments.

Novosound's collaboration at the Texas Medical Centre earlier laid the groundwork for this advancement, which now stands to transform the way blood pressure is monitored through wearable technology.

The credibility of the system was showcased at the IEEE International Ultrasonics Symposium in Taipei last month, where they presented data demonstrating accuracy on par with traditional

cuff devices.
Novosound founder and CEO **Dave Hughes** said: "Scotland has long been at the forefront of ultrasound innovation, and we are proud to continue this legacy.

Monitoring blood pressure with ultrasound, and without the need for a cuff, marks a significant advancement in how we can address global health and wellness issues." Dave Hughes spoke at UIA52 in Dublin this past April.

The Slanj platform's capabilities extend beyond blood pressure monitoring, with potential applications in hydration tracking, muscle health, and gesture control.
The company's recent funding success, securing $2.6m led by Par Equity and contributions from Kelvin Capital, the University of the West of Scotland, and Scottish Enterprise, will expedite the commercial rollout of its ultrasound solution.

Par Equity managing partner Paul Munn said: "With innovation at its core, we are pleased to continue our support for Dave and the team as the company accelerates internationalisation and global sales. We can see the traction the company is gaining with some of the world's largest corporate brands, with considerable commercial opportunities ahead in digital health and industrial monitoring markets."

Novosound is set to exhibit these advanced technologies at CES 2025 in Las Vegas in January, further establishing its presence in the wearable tech market.

Monitoring blood pressure with ultrasound, and without the need for a cuff, marks a significant advancement in how we can address global health and wellness issues.

From the President

Margaret Lucas

UIA President

Welcome to the winter edition of Vibrations. The call is out for our annual UIA Symposium, which will be held at the Westin Nova Scotian Hotel in Halifax, Canada in April 2025. Springtime in beautiful Nova Scotia and three days of fantastic talks and discussions on ultrasonics – sounds perfect.

The Symposium Chair is Dr Andrew Mathieson. He is based at Ultra Maritime in Halifax so will provide valuable local knowledge. We have a full day of talks planed on industrial applications and a full day on medical applications. Karl Graff is confirmed as an invited speaker, giving a talk about his long and illustrious career in power ultrasonics, much of it at EWI and Ohio State University, and his many important contributions. Frank Balle will give an invited talk on ultrasonic-assisted technologies for circularity engineering and value-retention, providing an important focus on sustainability and waste reduction. Other speakers are being confirmed and we are anticipating a really exciting three days. We have called the middle day programme 'Concept to IP' and it kicks off with an invited talk by Professor Jeremy Brown from Dalhousie University on the medical imaging and therapy technologies he has developed in his lab and his strategy for bringing the technology to market. We then have talks and a panel discussion with involvement from the local ultrasound and sensors communities in Halifax. Finishing the middle day with a tour and dinner at Alexander Keith's Brewery, we will get time to relax and enjoy Halifax hospitality. Please do join us in Halifax – I look forward to seeing you there.

UIA Board

Tribute to Alan Winder: August 6, 1936 - September 13, 2024

by Robert Muratore, PhD FAIUM, UIA Past President

I met Alan on my first visit to a UIA event, back around 2002 when they were held regularly in Atlantic City, New Jersey.

For much of his career, Alan consulted for the United States Navy, designing sonar systems. Unclassified aspects were consolidated in his definitive monograph "Introduction to Acoustical Space-Time Information Processing" [1] and in his award-winning 1975 IEEE paper "Sonar System Technology" [2]. He authored 11 patents and over two dozen journal articles, six of which are considered highly influential by Semantic Scholar.

Alan was deeply knowledgeable about the relevant literature, exploiting his knowledge to advance the field of acoustic microscopy, to invent synthetic structural imaging [3], and to develop ultrasonic therapies. He was one of the designers of the Exogen bone healing device. He later recruited me to help him design a modern bone growth stimulator, and together with his son Jason as CEO we formed Sonogen Medical .

He had a strong grasp of statistics and mathematics and was endlessly inspired by the Central Limit Theorem [4] and the Buckingham Pi Theorem [5].

Alan also had a keen eye for art, and was intrigued by Dale Chihuly's blown glass sculptures [6]. Alan organized many trips to the Metropolitan Museum

Alan (left) and Jason Winder at the Mayo Clinic, 2017

of Art with UIA members. We would find a quiet spot to sit and contemplate modern art. (He once described Mark Rothko's paintings [7] to a reluctant fellow engineer as "minimal sets of functional dependencies," [8] which satisfied the skeptic.) Afterward, he would explain his latest ideas in ultrasound. He loved to explain things, but his expositions were so packed with ideas that it would take me months to fully understand what he had told me. The Met treks always ended with a visit to the Sub-Saharan African Art collection, where his favorites included the Dogon "Seated Couple" [9]. He saw in this sculpture a reflection of his deep connection to his wife Ruth.

When Ruth was taken to hospice, Alan experienced takotsubo cardiomyopathy (literally broken heart syndrome). On one of his last days, he asked his son to bring him his acoustics notebook. Soon after, in September 2024, he passed away.

Alan was kind, intelligent, tall, strong, and a real contributor to society. We will be poorer without him.

Contributions in Alan's memory can be made here: https://www.gofundme.com/f/in-loving-memory-support-for-parkinsons-research

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VISIT US AT
ULTRASONICS.ORG

How can ultrasonics enhance the value of your business?

UIA is the international business forum for users, manufacturers, and researchers of ultrasonics. Our members use acoustic vibrations to improve materials, industrial processes, and medical technology. We call this *powering sound ideas.*

Let's work together to power your sound ideas. Contact a member consultant or company through our online Referral Network, learn about ultrasonics with our online primer, or meet industry leaders at our next symposium.

Important Dates

UIA 53
powering sound ideas
28 - 30 April 2025
The Westin Nova Scotian, Halifax, Canada

1 February 2025: Abstracts due for UIA53

7 April 2025: Deadline to make hotel reservations for UIA53: 1-866-761-3513

28 - 30 April 2025: UIA53, Westin Nova Scotian Hotel, Halifax, Nova Scotia